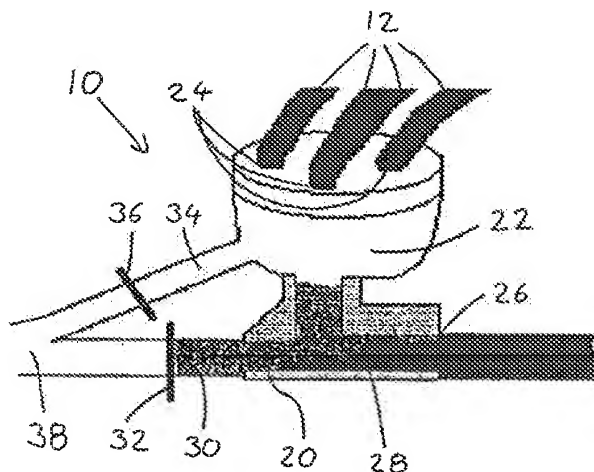



**PCT** WELTORGANISATION FÜR GEISTIGES EIGENTUM  
 Internationales Büro  
 INTERNATIONALE ANMELDUNG VERÖFFENTLICHT NACH DEM VERTRAG ÜBER DIE  
 INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT)

(51) Internationale Patentklassifikation <sup>6</sup> : <b>A01J 5/01</b>	<b>A1</b>	(11) Internationale Veröffentlichungsnummer: <b>WO 97/01953</b>  (43) Internationales Veröffentlichungsdatum: 23. Januar 1997 (23.01.97)
(21) Internationales Aktenzeichen: PCT/EP96/02810 (22) Internationales Anmeldedatum: 27. Juni 1996 (27.06.96)  (30) Prioritätsdaten: 295 10 414.7          3. Juli 1995 (03.07.95)          DE  (71) Anmelder (für alle Bestimmungsstaaten ausser US): MELTEC MASCHINEN GMBH [DE/DE]; Von-Nagel-Strasse 29-43, D-59302 Oelde (DE).  (72) Erfinder; und (75) Erfinder/Anmelder (nur für US): DÜCK, Matthias [DE/DE]; Reelitzsteg 5, D-21255 Tostedt (DE). KIMM, Kurt [DE/DE]; Rüssendstrasse 96, D-27367 Reeßum (DE). HARTWIG, Wolfgang [DE/DE]; Mühlenstrasse 47, D-28870 Otterstedt (DE).  (74) Anwalt: RABUS, Werner, W.; Eisenführ, Speiser & Partner, Martinistrasse 24, D-28195 Bremen (DE).		(81) Bestimmungsstaaten: JP, US, europäisches Patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  Veröffentlicht <i>Mit internationalem Recherchenbericht.</i>

(54) Title: MILKING DEVICE

(54) Bezeichnung: MELKVORRICHTUNG



(57) Abstract

Disclosed is a milking device with a plurality of teatcups and a measuring device for determining at least one milk parameter, the measuring device having a measurement chamber which receives the flow of milk from the teatcups.

(57) Zusammenfassung

Es wird eine Melkvorrichtung mit mehreren Zitzenbechern und einer Meßeinrichtung zum Ermitteln wenigstens eines Milchparameters angegeben, wobei die Meßeinrichtung eine Meßkammer aufweist, in die die Milchströme aus den Zitzenbechern münden.

## Milking device

The present invention relates to a milking device with four teatcups and a measuring device for determining at least one milk parameter.

A large number of milking devices are currently known which enable milk to be obtained more or less automatically. These milking devices usually have teatcups which can, for example, be attached to the four teats of a cow's udder and milk then extracted with the aid of pulsating movements or underpressure in the teatcups. To meet quality requirements and milk regulations, the milk is inspected at each milking. The test allows conclusions to be drawn about udder health.

To carry out this test a small amount of milk, the foremilk, is first taken from each teat and separately examined in a measuring device. Standard measuring cells are mainly used in these measuring devices, enabling a milk parameter, such as its electrical conductivity, to be determined. As a milk parameter must be separately tested for each teat, significant time and costs are usually involved.

The object of the present invention is to reduce to the maximum extent the time and costs involved in testing the milk.

According to the invention the object is achieved through the measuring device of the above-mentioned type having a measurement chamber which receives the flow of milk from the teatcups. Foremilk from each teat is successively introduced into the measurement chamber and tested. The cost of one measurement chamber is relatively low, so a significant saving can be made compared to known devices which are, for example, fitted with four separate measurement chambers.

Through appropriate adaptation of the measurement chamber, the time disadvantages involved with sequential testing of foremilk can be avoided. Teatcups are usually attached to each teat successively. By using the device according to the invention the first teatcup can be already attached and extracting a foremilk sample while the second teatcup is being applied. After a suitable test sample of foremilk has been obtained by pulsating the first teat cup, the pulsator of the first teat cup is switched off, the foremilk sample is tested, for example by

measuring its electrical conductivity, and it is then blown out of the measurement chamber. Then, as soon as the second teat cup is attached to the corresponding teat, its pulsator can be switched on to obtain the second sample of foremilk. The second sample of foremilk is thus received after the first sample and since the first sample has been blown out, the second sample occupies the measurement chamber separately and can be separately tested as required. The procedure for the samples of foremilk from the third and fourth teats is carried out similarly.

In an advantageous embodiment the measurement chamber has two compartments, whereby one is used as a measuring compartment and the other as an overflow compartment. The measuring compartment is preferably located below the overflow compartment.

A further embodiment is preferred where the measurement chamber is provided with a measuring cell, which preferably contains devices for measuring the electrical resistance of the milk. In the preferred embodiment the measuring cell is located in the lower part of the measuring compartment. Additionally the measurement chamber preferably has a fill level sensor which is preferably located in the upper part of the measuring compartment.

The measurement chamber of the preferred embodiment has inlets which are directly connected by milk lines to the teatcups, and are preferably located in the overflow compartment. Additionally the preferred embodiment has at least two outlets, with one located at the lowest point of the measuring compartment and the other in the overflow compartment. Lines are preferably connected to the outlets, flow out of the measurement chamber into a common line and can preferably be closed off between the common line and the measurement chamber.

Additionally the measurement chamber of the preferred embodiment has a means for complete emptying and cleaning of the measurement chamber, as well as a control device which is used to control filling of the measurement chamber with the foremilk from a teat, subsequent measuring and final emptying and cleaning of the measurement chamber, and then repetition of these steps for the foremilk from other teats.

As the measurement chamber according to the invention is directly connected to all the teatcups, the foremilk from each teat can be automatically discharged into the measurement

chamber and then tested, so the foremilk does not have to be removed from the milking device in order to be then separately tested. Care must only be taken that the measurement chamber is blown out after each test sufficiently thoroughly to ensure that the foremilk from different teats is not mixed. This requirement is particularly satisfied by using the measurement chamber in its preferred embodiment.

The principle significant advantages of the invention are that only one measuring cell is required per milking station and that the measurement chamber, although connected to the teatcups, can be placed in a protected location outside the area of influence of the animal to be milked.

The following Figures illustrate the invention in more detail:

- Figure 1      a milking device with measurement chamber; and
- Figure 2      an enlarged view of a measurement chamber according to Fig. 1.

A milking device, used for example with cows, consists of four components, some of which, involved in the operation of the measurement chamber 10, are shown in Figure 1. In addition to the measurement chamber 10, the flexible conduits 12 leading to the four teatcups 14 are important components. In the diagram the teat cups 14 are shown connected to four teats 16. Device 18 is used for extending and retracting conduits, and is not significant for the invention. A feature of the preferred variant is that the conduits 12 are not interrupted between the teatcups 14 and the measurement chamber 10, for example by valves or in device 18.

Figure 2 is a detail of Figure 1 and shows the measurement chamber 10. The measurement chamber 10 is shown in perspective and partly in section so its main features can be clearly seen. The measurement chamber 10 contains two compartments, the measuring compartment 20, which is shown in section in the lower part of the diagram, and an overflow compartment 22, which is shown closed. The overflow compartment 22 has four inlets 24, which receive the flexible conduits 12 from the teatcups 14. The measuring compartment 20 is located under the overflow compartments 22. The top of this measuring compartment 20 is open to the overflow compartments 22 and at the bottom has two openings, the first opening 26 being used to attach a measuring cell 28 and the second opening to connect to the first line 30, which can be closed with a valve 32.

In addition to the opening to the measuring compartment 20, the overflow compartment 22 also has a second outlet, which is connected to a second line 34, and which like the first line 30 can be closed by means of a valve 36. Lines 30 and 34 flow in a common line 38 on the side of the measurement chamber with valves 32 and 36.

In the common line 38 the underpressure required to extract the milk is applied at least some of the time. This underpressure is applied to the measurement chamber 10 to obtain the sample of foremilk by first opening valve 36. At the same time the teat cups 14 pulsate so milk is removed from teats 16 and is extracted into the overflow compartment 22 due to the underpressure in the measurement chamber 10. From there the milk flows to the floor of the overflow compartment 22 into the measuring compartment 20 through the opening between overflow compartment 22 and measuring compartment 20. The milk collects there as long as valve 32 is closed, so the milk cannot leave the measuring compartment 20 through the first line 30. As long as the measuring compartment 20 is not completely filled, no milk is extracted through line 34, as it is not placed on the bottom of the overflow compartment 22 but a little higher.

To obtain the sample of foremilk, valve 32 remains closed and valve 36 open, while at the same time the teat cup is pulsated which is connected to the teat whose foremilk is to be sampled. This continues until the measuring compartment 20 is full enough to avoid a faulty measurement. An adequate fill level is indicated in Figure 2. To ensure this is observed, the upper part of the measuring compartment 20 has a fill level sensor which is not illustrated.

As soon as the measuring compartment 20 is adequately filled, the corresponding teat cup 14 stops pulsating and valve 36 is closed, so no further milk is extracted from the corresponding teat. The measuring cell 28 is then used to measure the specific resistance of the milk in the measuring compartment 20. If the milk has a non-conforming measurement, it can be concluded there is an udder health problem. The milk subsequently collected is not for human consumption.

When the milk test for a teat is complete, valve 32 is opened and the milk sucked out of the measuring compartment 20. For this purpose a purge valve between the measurement chamber 10 and the overflow compartment 22 can be opened at the same time. The purge valve is not shown in the Figure. After complete emptying of the whole measurement chamber 10, valve 32 is again closed, valve 36 opened and the pulsator in the teat cup for the

next teat started. The next sample of foremilk is then obtained in the same way as the previous one but does not come into contact with it due to the complete emptying of the measurement chamber between sampling.

When samples of foremilk have been taken from all four teats of a cow as described and tested, actual milking begins. Both valves 32 and 36 are then opened and the pulsators of all four teat cups 14 started. The milk now flows through all four conduits 12 into the measurement chamber 10 at the same time and then through the overflow compartment 22 and measuring compartment 20, passes the valves 36 and 32 and is finally extracted through the common line 38. The common line 38 is connected to a milk meter which is used to control the milk flow and can stop milking as soon as the milk flow decreases.

Depending on whether one of the four samples of foremilk taken from the udder was non-conforming or not, the milk is finally either collected in a container with milk for human consumption or in a container with milk not fit for human consumption. Diversion of the milk into one of the two containers is by means of valves which are not shown in the Figure.

Since the teat cups 14 are separately and successively applied to the cow teats 16 and the first sample of foremilk can be removed and tested while the second teat cup is still being applied, there is in practice no time delay incurred by testing the milk sequentially. However there is a significant saving in time and money because just a single measurement chamber with only one measuring cell is needed for the separate testing of milk from all four cow teats.

All the described procedures are activated and monitored by a control system which is not shown in the Figures.

C l a i m s

1. Milking device with a plurality of teatcups and a measuring device for determining at least one milk parameter,  
characterised in that the measuring device has a measurement chamber which receives the flow of milk from the teatcups.
2. Milking device according to claim 1,  
characterised in that the measurement chamber has two compartments, with one serving as a measuring compartment, and the other as an overflow compartment.
3. Milking device according to claim 2,  
characterised in that the overflow compartment is located above the measuring compartment.
4. Milking device according to one of the claims 1 to 4,  
characterised in that the measurement chamber is provided with a measuring cell.
5. Milking device according to claim 4,  
characterised in that the measuring cell has devices for measuring the electrical resistance of the milk.
6. Milking device according to claim 4 or 5,  
characterised in that the measuring cell is located in the lower part of the measuring compartment.
7. Milking device according to one of the claims 1 to 6,  
characterised in that the measurement chamber has a fill level sensor.
8. Milking device according to claim 7,  
characterised in that the fill level sensor is located in the upper part of the measuring compartment.
9. Milking device according to one of the claims 1 to 8,

characterised in that the measurement chamber has inlets which are directly connected to the teatcups via milk conduits.

10. Milking device according to claim 9, characterised in that the inlets are located in the overflow compartment.

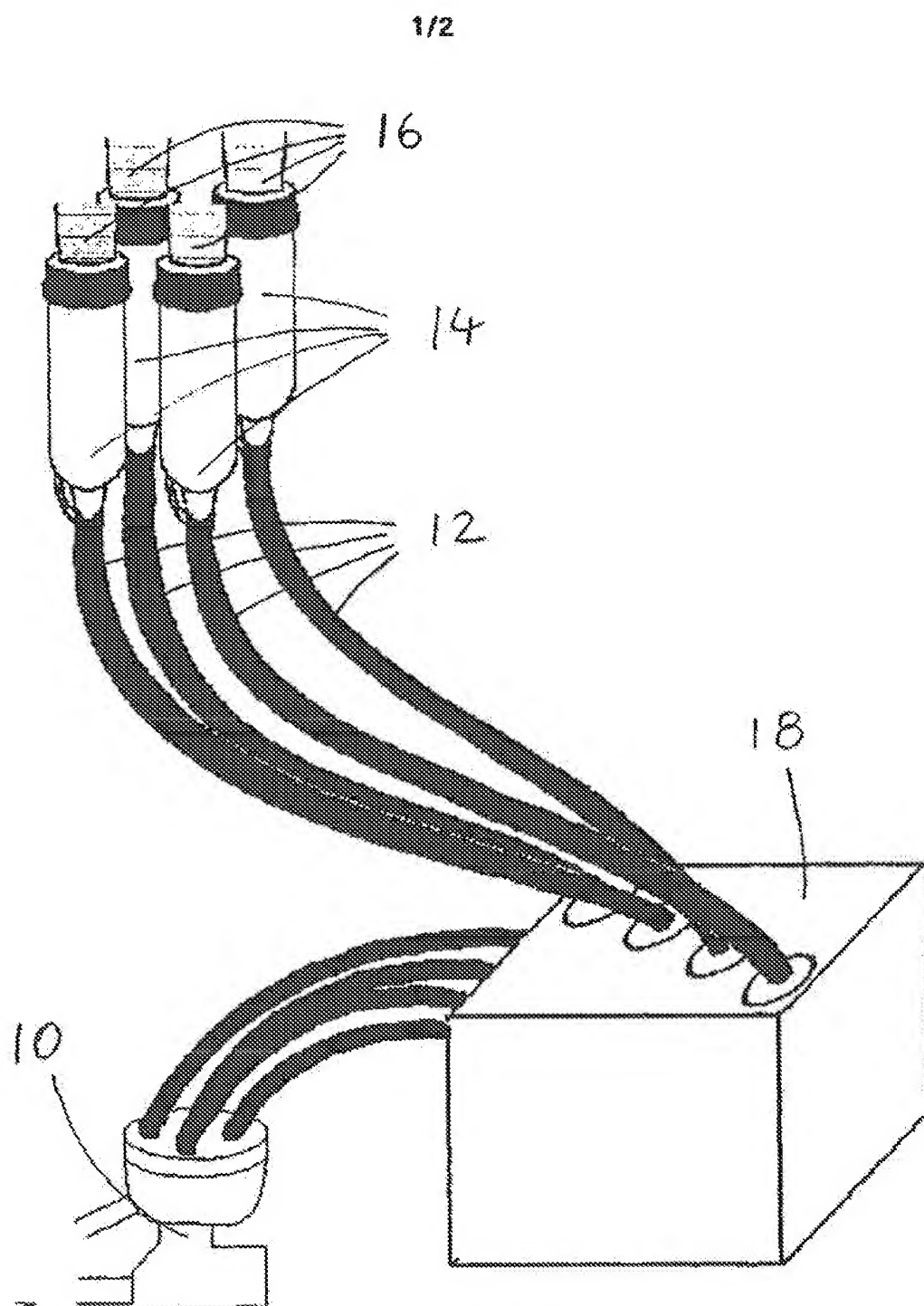
11. Milking device according to one of the claims 1 to 10, characterised in that the measurement chamber has at least two outlets, with one located at the lowest point of the measuring compartment and the other in the overflow compartment.

12. Milking device according to claim 11, characterised in the outlets are connected to lines which flow into a common line outside the measurement chamber.

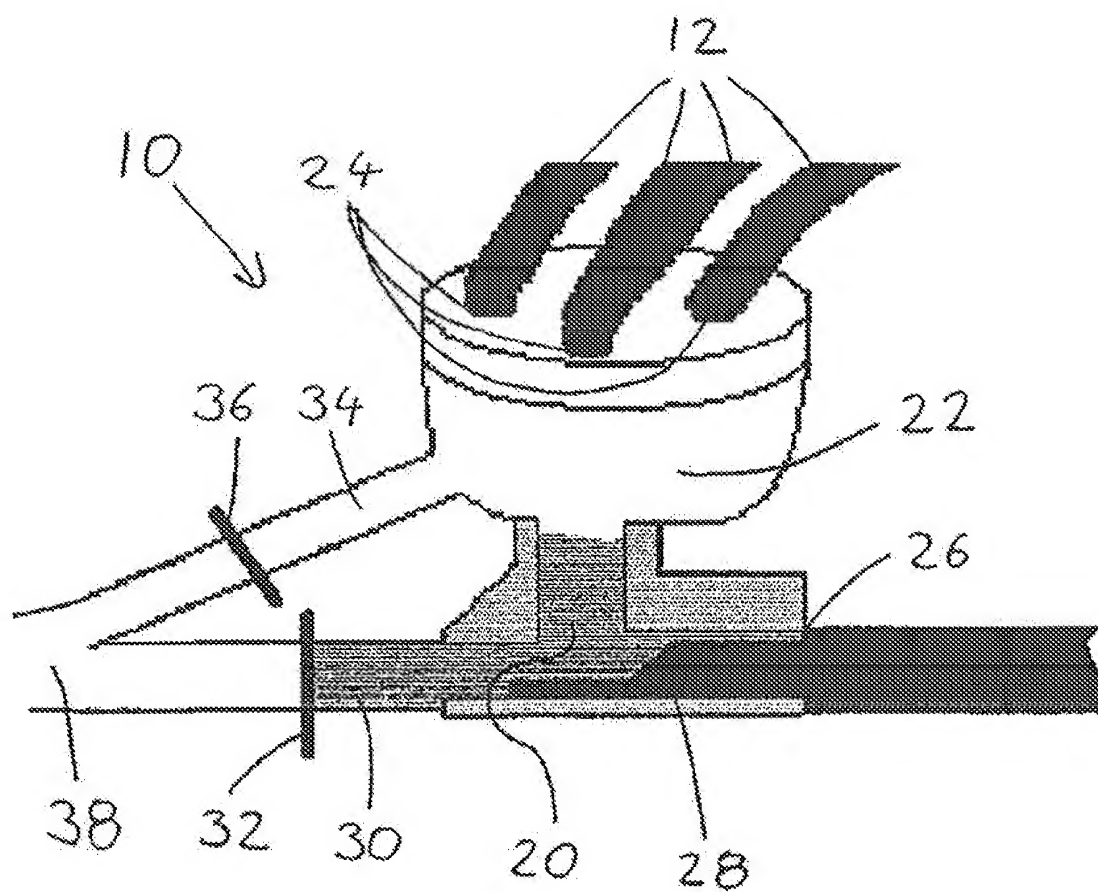
13. Milking device according to claim 12, characterised in that the lines between the common line and the measurement chamber can be closed.

14. Milking device according to one of the claims 1 to 13, characterised in that the measuring device has a means for complete emptying and cleaning of the measurement chamber.

15. Milking device according to one of the claims 1 to 14, characterised in that the measuring device has a control device for filling the measurement chamber with the foremilk from a teat, subsequent measuring and final emptying and cleaning of the measurement chamber and then repetition of these steps for the foremilk from additional teats.

**Fig. 1**

2/2

**Fig. 2**